INFLUENCE OF RURAL LANDSCAPE STRUCTURES ON THE DISPERSAL OF THE ASIAN TIGER MOSQUITO *AEDES ALBOPICTUS*: a study case at La Reunion Island

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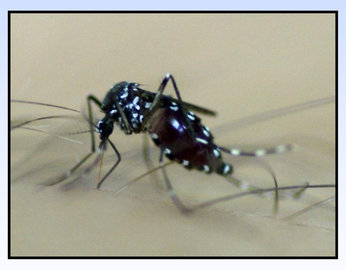
CONTEXT

Invasive behaviour
Vector of Chikungunya

Vector of Dengue
World wide distribution

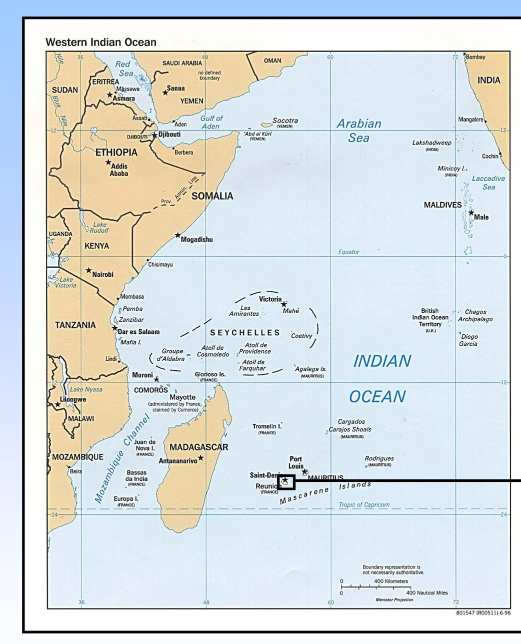


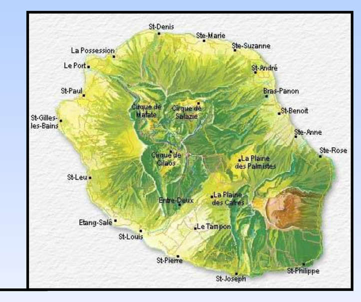
Aedes albopictus

Aedes albopictus Skuse (Diptera: Culicidae) is a mosquito species of major importance involved in the transmission of several diseases (Dengue, Yellow Fever, Chikungunya, West Nile Fever). *Ae. albopictus* is considered as the most efficient vector of Chikungunya virus and second for the dengue. This species has a high dispersal ability and is considered as an invasive species. Following the Chikungunya outbreak in 2006 at La Réunion island, the biology of *Aedes albopictus* is under investigation.

The dispersal of male *Ae.aAlbopictus* must be understood in a SIT programme in order to optimize the release of sterilized males using landscape ecology tools.

Indian Ocean





La Reunion Island

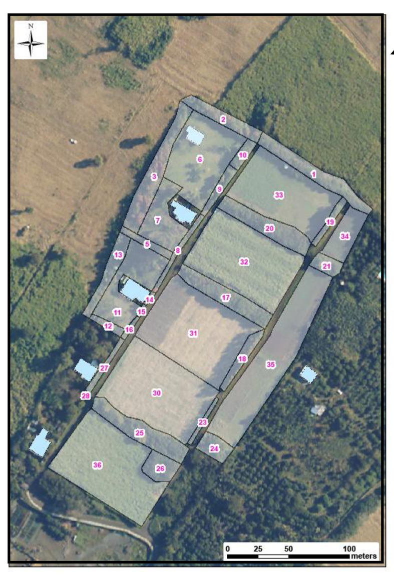
METHODOLOGY: two major levels

Lanscape level :

Raster & vector analysis

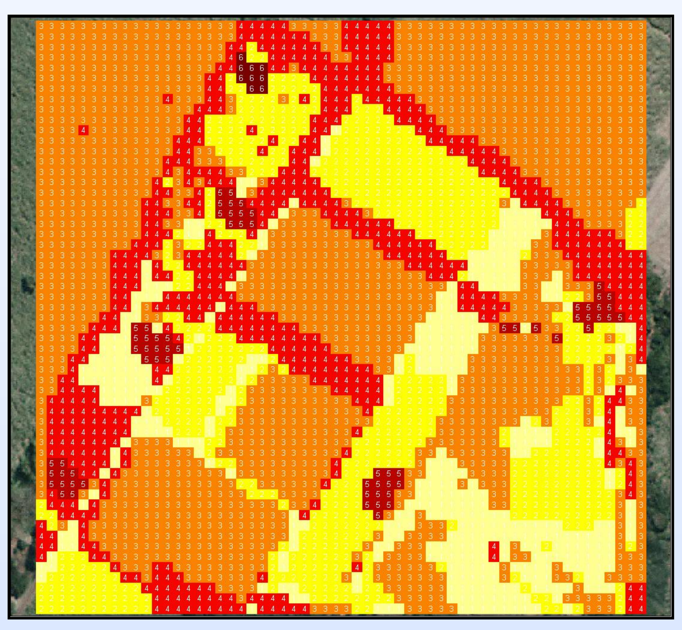
The study site (2 ha)

Mapping the landscape mosaic



Vector map of the experimental site

Raster map (5m x 5m pixels)



1 2 3 4 5

- Hedges
- Sugar cane fields
- Gardens
- Houses

The different landscape elements of the site (matrix, patches, corridors) are mapped using the ArcGis software and ~~a connectivity index is used~~ to estimate the length between two contact classes as follows:

$$IJI = \frac{-\sum_{i=1}^{m}\sum_{k=i+1}^{m}\left[\left(\frac{e_{ik}}{E}\right)\cdot\ln\left(\frac{e_{ik}}{E}\right)\right]}{\ln(0.5\, m(m-1))}(100)$$

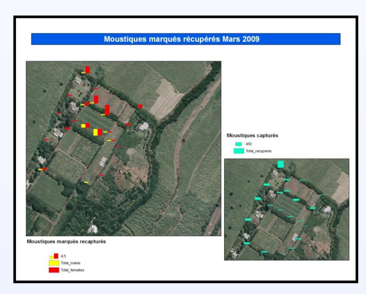
The raster model will be used to determine the roughness and aggregation of elements (contacts between pixels of a same class of land use *i* in a given window/possible maximum number of contacts) using indexes as follows:

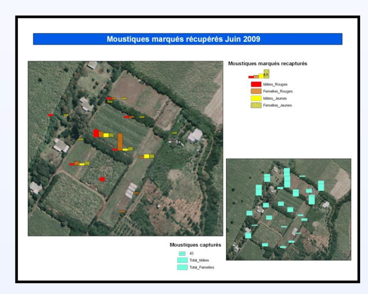
$$AI = \sum_{i=1}^{m}\frac{g_{ii}}{\max \rightarrow g_{ii}} * 100$$

Population level :

Mark Release and Recapture Technique

25 BG Sentinel traps to catch adult *Aedes albopictus*





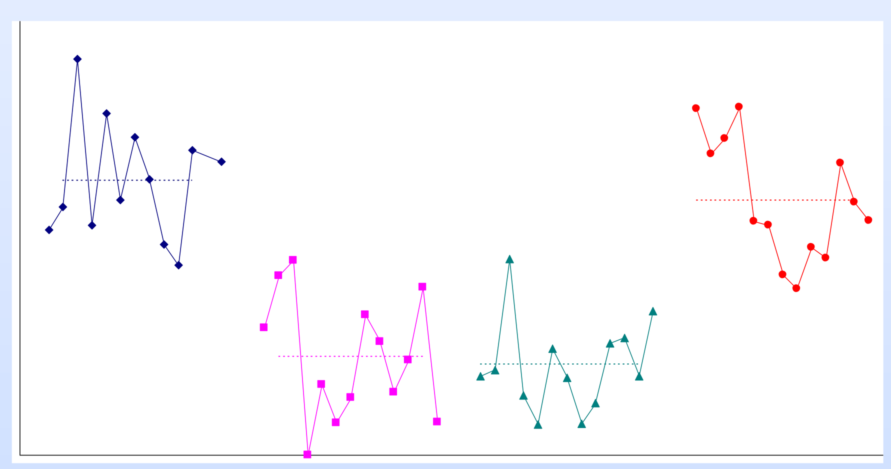
Number of catched mosquitoes/trap/day

N0 = M0R1 / (M0(1-E-µm) + MR1)

6000/ha

3000/ha

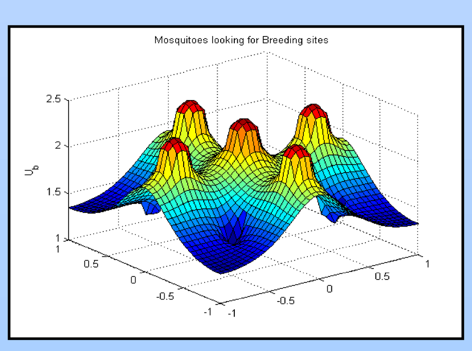
0



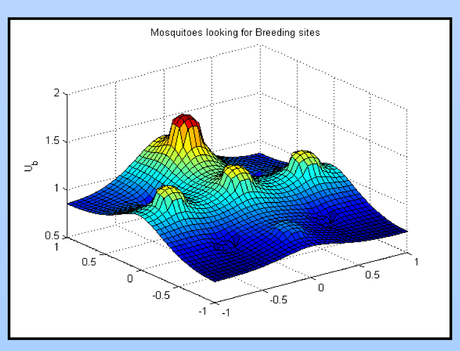
March June Sept. December

Estimates of the size and distribution of the population at a local scale help us understand the impact of landscape structures and environmental factors on the dispersal of the insect.

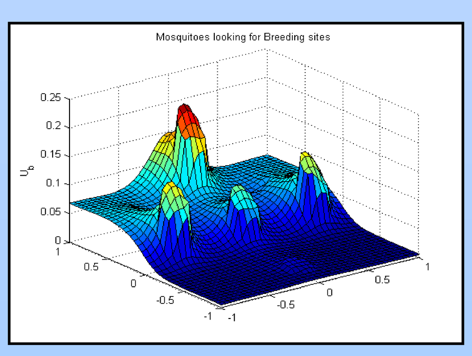
PRELIMINARY RESULTS AND FUTURE RESEARCH



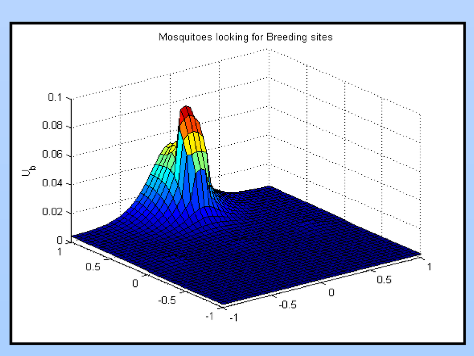
A



B



C



D

A: without mosquito control, no wind

B: with mosquito control, south wind

C: without mosquito control, strong south wind

D: with mosquito control, strong south wind

Impact of environmental factors (treatments, wind) on the distribution of mosquitoes (in red: breeding sites; in yellow: blood feeding sites) using a diffusion model (system of quasi linear partial differential equations) on an homogenous landscape.

The next step is the use of a complex landscape model including several indexes in order to estimate the role of the major filters and corridors in the context of optimized releases of sterile males.

REFERENCES

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Boyer S., Dehecq J.S., Lemperiere G., Dumont Y., Estimating the population size of *Aedes albopictus* at La Réunion island in prep.

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